Resource - Soil

1. SOIL EROSION

A. Sheet and Rill Erosion

Definition: The detachment and transport of soil particles by raindrop impact, surface runoff from rainfall and snowmelt runoff on frozen and thawing soil that results in a negative impact on soil productivity.

QUALITY CRITERIA:

Target: The estimated average annual soil loss in tons per acre per year shall not exceed the soil-loss tolerance (T) for the planning soil on lands used to produce crops and improved forage. For rangeland, a score of Moderate or greater for the Rills attribute in the Rangeland Health Ecological Attributes Worksheet.

Indicator: Estimated average annual sheet and rill erosion is predicted using the Revised Universal Soil Loss Equation (RUSLE). References for RUSLE are found in Section I, Erosion Prediction, Conservation Planning and Effects in the Conservation Planning Tool Kit and Agricultural Handbook Number 703, January 1997. Soil-loss tolerance (T) values in tons/acre/year are shown in Section II-iii-a, Cropland Interpretations. Rangeland is assessed with the Rangeland Health Ecological Attributes Worksheet in the National Range and Pasture Handbook.

Additional Quality criteria are met when measures are planned so that the estimated sheet and rill erosion rates are reduced to the tolerable level for the dominant* soil*, *whereby long term soil degradation is prevented and a high level of the soil's productivity can be sustained

**** Dominant soil is the most erosive soil of a significant area within a field or conservation treatment unit..***

B. Wind Erosion

Not applicable in the Caribbean Area

C. Concentrated Flow Erosion

Definition: The detachment and transport of soil particles from surface runoff that has concentrated in channels resulting in a negative impact on soil productivity (includes ephemeral gullies on cropland). Concentrated flow channels along depression watercourses that begin where overland flow, including rills, converge. On cropland, these channels are filled by tillage operations. These gullies range in size from a few inches to 10 inches deep and from 1 foot to several feet wide.

***QUALITY CRITERIA*:**

Target: The estimated soil loss in tons per year for each concentrated flow channel shall not exceed the soil-loss tolerance (T) for the soil map unit. For rangeland, a score of Moderate or greater for the Water Flow Patterns attribute in the Rangeland Health Ecological Attributes Worksheet.

Indicator: Concentrated flow erosion is estimated in the field from measurements of individual channel cross sections and lengths, interviews with the client, historical aerial photography and observations. Soil loss tolerance (T) values in tons per acre/year are shown in Section II-iii-a, Cropland Interpretations. Rangeland is assessed with the Rangeland Health Ecological Attributes Worksheet in the National Range and Pasture Handbook.

Additional Quality criteria are met when the necessary management and/or structural measures are planned that treat the area to control erosion in flow channels.

D. Classic Gully Erosion

Definition: The movement of soil by concentrated flow of water in channels. Gullies are too deep to be obscured by normal field operations on cropland, resulting in a negative impact to other resources. Such channels are subject only to ephemeral water flow in response to runoff producing events, such as storms or rapid snowmelt. These channels are lengthened and enlarged by subsequent runoff events that cause water to erode and deepen the channel headward over a nick point and to widen the channel by bank failure. They are to deep to be crossed by normal farming operations.

QUALITY CRITERIA:

Target: Active head cutting, sloughing of the side-slopes, and further gully enlargement are stopped and the erosive soils are stabilized. For rangeland, a score of Moderate or greater for the Gullies attribute in the Rangeland Health Ecological Attributes Worksheet. For pasture, a score of 3 or greater for the Gully indicator in the Pasture Condition Score Sheet.

Indicator: The observation and recognition of the potential of a site to contribute runoff water to a gully or for the concentration of runoff to produce erosive conditions across a potential nick point. Classic gully erosion is estimated in the field by measurement of cross sections and length, interviews with the client, comparison of historical photography and observations. Rangeland is assessed with the Rangeland Health Ecological Attributes Worksheet in the National Range and Pasture Handbook. Pasture is assessed with the Pasture Condition Scoring procedure in the National Range and Pasture Handbook.

Additional Quality criteria are met when measures are planned that limit erosion from classic gullies by stabilizing channel bottom head cuts and the gully side walls to prevent erosive velocities. In cases where the decisionmaker cannot solve the problem alone, the Conservation Treatment Unit (CTU) criteria will be met when the planned actions of the decisionmaker are not adversely contributing to gully erosion.

EROSION

E. Streambank Erosion

Definition: The movement of soil from sloughing of streambanks caused by overbank flow, unstable soils, bank scour at obstructions, unstable channel bottom, or all of these, resulting in a negative impact.

QUALITY CRITERIA:

Target: The land users management activities do not contribute to the streambank erosion problem.

Indicator: Streambank erosion rates are quantified through interviews with the client, comparison of historical photos, and measurement of bank sections using the Stream Visual Assessment Protocol or Biology Technical Note #12 (Habitat Assessment).

Additional Quality criteria are met when measures are planned that stabilize streambanks. In cases where the decisionmaker cannot solve the problem alone, the Conservation Treatment Unit (CTU) criteria will be met when the planned actions of the decisionmaker are not adversely contributing to streambank erosion.

F. Irrigation Induced

Definition: The detachment and transport of soil particles by irrigation water resulting in a negative impact on soil productivity. Erosion caused by excessive amounts and/or velocity of water in row, furrow, and sprinkler irrigation activities or by water conveyances and tracks from center pivots and traveling guns.

***QUALITY CRITERIA*:**

Target: Erosion on irrigated fields will be reduced to levels that will not cause a significant impact to soil productivity. The estimated average annual soil loss in tons per acre per year shall not exceed the soil-loss tolerance (T).

Indicator: Irrigation runoff from irrigated fields will be observed for sediments. Where no sediments are observed in runoff from irrigated fields entering receiving waters, Quality criteria is met. Where sediments are observed in runoff from irrigated fields, samples shall be taken of the sediment laden runoff and sediment concentrations quantified. Procedures developed for using an Imhoff Cone or other acceptable methods will be used to estimate concentrations of sediment in irrigated runoff water. Soil-loss tolerance (T) values in tons/acre/year are shown in Section II-iii-a, Cropland Interpretations.

Additional Quality criteria are met when measures are planned that provide erosion reduction to tolerable levels through the use of irrigation water management as stated in the Florida Irrigation Guide (National Engineering Manual, 523.02) and through companion agronomic and residue management practices. Irrigation Water Management is an essential practice. Alternative types of irrigation applications and equipment may be necessary.

G. Soil Mass Movement

Definition: Soil slippage, landslides, or slope failure, normally on hillsides, in deep cuts, or through unstable soil on sloping land, that creates a large volume of soil movement.

QUALITY CRITERIA:

Target: No increased incidence of soil mass movement due to land users operations or management.

Indicator: The observation and recognition of the potential of a site for soil mass movement and identification of activities that can adversely affect the stability of the area.

Additional Quality criteria are met when measures are planned to prevent or minimize soil mass movement at a rate that does not exceed normal geological processes. Treatment may preclude use of some conservation practices that increase infiltration or help solve drainage problems. In cases where the decisionmaker cannot solve the problem alone, the CTU criteria will be met when the actions of the decisionmaker no longer adversely contribute to the problem.

H. Roadbanks, Construction Sites and Scoured Areas *

Definition: The movement of soil by water or wind from roadbanks, construction sites, or scour areas resulting in a negative impact.

QUALITY CRITERIA:

Target: Roadbanks are stable, with no visible erosion. Erosion from construction sites will have no adverse off-site effects. Scour areas are stabilized. Erosion hazards will be addressed within the site. Such areas do not contribute sediment offsite.

Indicator: Runoff from the site will be observed for sediments. Where no sediments are observed in runoff from the site, quality criteria is met. Where sediments are observed in runoff, estimates of the erosion rate will be quantified.

Roadbanks - Criteria are met when measures are included to shape slopes to an acceptable grade, to estabilize banks, and to safely convey overland and channel flow. As a minimum, both NRCS and commonwealth standards will be met.

Construction sites - Criteria are met when measures for a temporary or permanent nature are planned to dispose off and safely convey excess surface water; to stabilize the site with vegetative or other materials as needed; and to prevent or control sediment leaving the site.

Scoured areas - Criteria are met when necessary measures are included to establish, temporary or permanent vegetation, considering flow velocity, depth, and probability of occurrence, to provide protection from scouring.

- Floodplain - Scouring generally is caused by watercourse overflow.
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2. SOIL CONDITION

A. Soil Tilth, Crusting, Water Infiltration, Organic Matter

Definition: The physical condition of the soil is impaired relative to the ease of tillage, fitness as a seedbed, the impedance to seedling emergence, root penetration and soil productivity. Crusting is the formation of a thin layer at the soil surface that is denser, structurally different, or more cemented than the material immediately beneath it. The rate of water entry into the soil is impaired. Soil organic matter is declining.

***QUALITY CRITERIA*:**

Target: The desired use of the soil will not be impaired due to management activities that result in poor soil tilth, soil crusting, reduced water infiltration, or declining soil organic matter. A Soil Conditioning Index value of 0.0 or greater will be achieved on cropland. For rangeland, a score of Moderate or greater for the Soil Surface Loss or Degradation attribute in the Rangeland Health Ecological Attributes Worksheet.

Indicator: Visual observation, infiltration measurements or laboratory measurements of soil organic matter.

Additional Quality criteria are met when measures are planned so that the soil condition does not impair the growth and vigor of the plant species of concern; or

restricts surface water infiltration, or available moisture to vegetation is restricted. Burning cropland residue is not acceptable. Soil tilth should be in a positive trend towards improvement.

High residue producing crops should be in the crop rotation that typically have an ability to produce adequate amounts of residue that can be managed for erosion control and soil tilth at the field office location and under the local soils and climate conditions.

Crops grown as cover or green manure of applied manure, litter, mulch, and other organic may be considered as high residue or soil-improving crops provided residue amounts meet or exceed that needed for the maintenance of soil tilth and erosion control.

B. Soil Compaction

Definition: An increase in the bulk density of a soil (weight per unit volume) as a result of applied loads, pressure, or vibration which impairs soil productivity. Is the excess compressing of soil particles and aggregates by machinery, livestock, and natural consolidation, thereby affecting the plant-soil-moisture-air relationship.

***QUALITY CRITERIA*:**

Target: The desired use of the soil is not impaired by compaction. For rangeland, a score of Moderate or greater for the Compaction Layer (below soil surface) attribute in the Rangeland Health Ecological Attributes Worksheet. For pasture, a score of 3 or greater for the Soil Compaction indicator in the Pasture Condition Score Sheet.

Indicator: The soil will have no measurable reduction in plant productivity due to compaction. Plant rooting depths will not be restricted due to compaction. Tile probes can be used to detect compacted tillage pans. Soil samples can be collected to measure bulk density and compare the results to similar soils that have not been subjected to compactive forces. Penetrometers can be used to measure soil strength, an indicator of soil compaction. Rangeland is assessed with the Rangeland Health Ecological Attributes Worksheet in the National Range and Pasture Handbook. Pasture is assessed with the Pasture Condition Scoring procedure in the National Range and Pasture Handbook.

Additional Quality criteria are met when measures are planned that provide management considerations to reduce vehicular or livestock traffic, reduce operations on wet soils (optimum soil moisture conditions), and plan proper timing of operations.

Soils are managed to avoid compaction beyond a point that impairs the growth and vigor of the plant species of concern or restricts surface water infiltration to the point where sheet and rill erosion exceed soil loss tolerance, or available moisture to vegetation is restricted.

CONDITION

C. Soil Contaminants/Excess Chemical Content, Salts, Selenium, Boron, Heavy Metals

Definition: Chemical contaminants impair the desired use of the soil.

***QUALITY CRITERIA*:**

Target: Chemical Contaminants will have no observable or measurable detrimental effect on the suitable use of the soil and adapted plant production.

Indicator: Observation of plant health and vigor. Laboratory analyses of soil samples to determine chemical concentrations. Visual observation of salt accumulations on the soil surface. The Oregon Engineering Handbook, Irrigation Guide contains salt tolerances of common crops.

Additional Quality criteria are met when measures are planned that establish or adjust management, cropping rotations, or land uses that are tolerant to the present chemical content and no longer restricts a suitable use.

Excess salinity is maintained at a depth below the normal rooting depth but does not contribute to degradation of quality of ground water supplies.

Applied chemicals through water or direct application are added at rates that do not damage current vegetation or cause a soil buildup.

Where excess chemicals are the result of applied materials, such practices as waste utilization, nutrient management and irrigation water management may become essential practices.

Effects of conservation practices on erosion, the detachment and transport of sediment and movement of sediment and attached substances are major concerns of pollution. The first goal in controlling pollution from cropland should be to control erosion.

D. Soil Contaminants/ Excess Animal Wastes and Other Organic Nutrients

Definition: Excess animal waste or other organic material that impairs the desired use of the soil.

***QUALITY CRITERIA*:**

Target: No observable or measurable adverse effect from animal waste or other organic nutrients on the suitable use of the soil and adapted plant production. A state

approved management plan and site permit is required when domestic sewage is applied to agricultural lands.

Indicator: Visual observation of impaired plant growth or sealing of the soil surface by organic waste accumulation. Following an approved management plan and maintaining application records.

Additional Quality criteria are met when planned measures reduce soil contamination from animal waste and other organic to a level that no longer contributes to problems that can restrict a suitable use of the soil. Waste Utilization and Nutrient Management are essential practices. When excess animal waste and other organic are identified as a problem or as potential problem, states will develop guidelines for collecting information to determine the amounts that have been applied. States will also require a Comprehensive Nutrient Management Plan for future applications that complies with the practice standards and takes into account rates for consumptive use by plants.

E. Soil Contaminants/Excess Fertilizers

Definition: Excess fertilizer (nutrients) compounds impair the desired use of the soil.

***QUALITY CRITERIA*:**

Target: No observable or measurable adverse effect from fertilizer application on the suitable use of the soil.

Indicator: Visual observation of impaired plant growth. Following an approved management plan and maintaining application records.

Additional Quality criteria are met when planned measures reduce soil contamination from excess fertilizer to a level that no longer contributes to the restriction of a suitable use of the soil. Where present or potential problems of excess nutrients are identified, criteria may require a soil test, water budget, and Nutrient Management practice be planned. Nutrient Management is an essential practice.

F. Soil Contaminants/ Excess Pesticides

Definition: The desired use of the soil is impaired by excess pesticides.

***QUALITY CRITERIA*:**

Target: No observable or measurable adverse effect from pesticides on the suitable use of the soil.

Indicator: Visual observation of impaired plant growth or poor seed germination. Laboratory analyses of soils or plant tissue to determine pesticide concentrations. Pesticide application plan and maintaining application records.

Additional Quality criteria are met when planned measures reduce soil contamination from excess pesticides to a level that no longer restricts a suitable use of the soil. If excess pesticides are a problem, criteria should consider the residual effects of pesticides on subsequent crops and land use. A water budget may be required. A Pest Management practice will become an essential practice on cropland. On non-cropland, criteria must consider the residual effect of future pesticides and prescribe proper application.

Offsite deposition damage needs to be viewed in two ways. Sometimes sediment leaving an offsite unit of land is diluted because of the inclusion of more drainage areas and may be less severe. Conversely, sediment leaving offsite may be combined with sediment delivery from other sources and cause a more severe offsite deposition problem.

3. SOIL DEPOSITION

A. Onsite Damage

Definition: The desired use of the soil is impaired by sediment that originates from within the same management unit. Deposition on roads that cause accidents, loss of life, and loss of access for emergency vehicles

***QUALITY CRITERIA*:**

Target: Soil erosion or sediment deposition within the unit is reduced to levels that no detectable damage occurs to vegetative cover, crop production or property.

Indicator: Onsite damage from sediment is estimated in the field from measurements of sediment deposition, estimates of crop loss or damage to vegetation and property, observation and client interviews.

Additional Quality criteria are met when measures are planned that eliminate adverse contribution to the identified deposition problem. This usually involves controlling erosion processes that significantly contribute to the higher rates of sediment yields (such as ephemeral or classic gullies) to prevent harmful sediment deposits to land and property.

B. Offsite Damage

Definition: Offsite damage occurs from sediment that originates from the management unit. Same as onsite. Offsite practice effects are presently less than onsite because of increased distance from source problem.

QUALITY CRITERIA:

Target: Soil erosion or sediment deposition leaving the management unit is reduced to levels that no detectable damage occurs to vegetative cover, crop production or property.

Indicator: Offsite damage from sediment is estimated in the field from measurements of sediment deposition, estimates of crop loss or damage to vegetation and property, observations and client interviews.

Additional Quality criteria are met when planned measures resolve the identified deposition problem. This usually involves controlling erosion that has higher rates of sediment yields (such as ephemeral or classic gullies) so deposition does not alter the plant soil moisture relationship, damage property, cause physical damage to vegetation or limit the intended use of the soil.

Offsite deposition damage needs to be viewed in two ways. Sometimes sediment leaving an offsite unit of land is diluted because of the inclusion of more drainage areas and may be less severe. Conversely, sediment leaving offsite may be combined with sediment delivery from other sources and cause a more severe offsite deposition problem.

C. Onsite Safety

Definition: Access to the site is restricted, increased accident risk and potential loss of life from sediment deposition originating from erosion within the unit.

***QUALITY CRITERIA*:**

Target: Soil erosion and deposition within the unit is reduced to levels that do not increase the risk of accident, loss of life and does not restrict traffic on the management unit.

Indicator: Onsite sediment is estimated in the field from measurements of sediment deposition, observation and client interviews.

Additional Quality criteria are met when planned measures resolve the identified deposition problem. This usually involves controlling erosion that has higher rates of sediment yields (such as ephemeral or classic gullies) so deposition does not alter the plant-soil moisture relationship, damage property, cause physical damage to vegetation or limit the intended use of the soil.

D. Offsite Safety

Definition: Access to sites away from the management unit are restricted, increased accident risk and potential loss of life from sediment deposition leaving the management unit.

***QUALITY CRITERIA*:**

Target: Soil erosion and deposition leaving the management unit is reduced to levels that do not increase the risk of accident, loss of life and does not restrict traffic off the management unit.

Indicator: Offsite sediment is estimated from field measurements of sediment deposition, observation and client interviews.

Additional Quality criteria are met when planned measures resolve the identified deposition problem. This usually involves controlling erosion that has higher rates of sediment yields (such as ephemeral or classic gullies) to prevent or eliminate the safety hazard.

Resource - Water

1. WATER QUANTITY

A. Seeps

Definition: Subsurface water flows onto the soil surface and impacts the desired land use.

***QUALITY CRITERIA*:**

1) Excess Water for Desired Land Use

Target: Water will be controlled to the extent that there is no reduction in desired land use, plant production, trafficability or slope stability and no concentrated flow erosion.

Indicator: Desired land use does not require management or maintenance more extensive than on the remaining treatment unit. Plant production is not limited by excess water.

Additional Quality Criteria are met when planned measures manage excess subsurface water by use of vegetative cover, subsurface drains, water control structures, or other practices so that it no longer restricts a suitable use of the land. Measures may include plants in the cropping rotation that use excess water, thereby reducing subsurface water flows. In case where the decisionmaker cannot solve the problem alone, the CTU criteria will be met when the planned actions of the decisionmaker are not adversely contributing to the seepage. Criteria will conform and be consistent with policy and laws regarding wetlands.

2) Inadequate Water for Desired Use

Target: Water reintroduced to the natural system and moisture relationships are similar to natural conditions for the site.

Indicator: Water surfaces naturally and creates conditions for wildlife habitat and groundwater recharge. References include photographs and reference sites.

B. Ponding/Flooding

Definition: Water accumulates on the soil surface and impacts the desired land use.

***QUALITY CRITERIA*:**

1) Excess Water for Desired Land Use

Target: No unacceptable damage to land, crops, or structures resulting from overland flow or standing water following a 2-year, 24-hour event. The desired land use is not negatively impaired.

Indicator: Observable damage is assessed based on assessment following a 2-year, 24-hour event.

Additional Quality criteria is met when planned measures safely and adequately remove excess runoff and flood water so that a suitable use of the land is no longer restricted. In those instances where management of saturation is restricted because of policy and laws, such as those pertaining to wetlands, the criteria will be met if policy and laws are followed.

2) Inadequate Water for Desired Land Use

Target: Water reintroduced to the natural system and moisture relationships are similar to natural conditions.

Indicator: Ponding (depth, duration, frequency and months) and flooding (frequency, duration, and month) are similar to soil properties in the Soil Survey for the treatment units soil mapping units.

C. Subsurface Water

Definition: The accumulation of water in the soil profile impacts the desired land use.

***QUALITY CRITERIA*:**

1) Excess Water for Desired Use

Target: Water will be managed to the extent that there is no adverse affect to plant growth and production operations.

Indicator: Subsurface water does not restrict operational activities or cause a discernable reduction in plant production.

Additional *Quality criteria are met when planned measures, both structural and vegetative methods, reduce excess subsurface water to a level that no longer restricts suitable use of the land. Vegetative management can prescribe the frequency of use of the water-tolerant plants and the crops to be grown.*

2) Inadequate Water for Desired Use

Target: Water reintroduced to the natural system.

Indicator: Soil moisture conditions (depth and months) are similar to pre-existing natural conditions of the site based on the site characteristics and NCSS soil properties and qualities.

D. Inadequate Water Outlets

Definition: Inadequate capacity of channels, culverts, and other structures that collect and remove water from the land and restrict the desired use of the land.

***QUALITY CRITERIA*:**

Target: Outlets prevent land damage, incised channels, unplanned deposition and excess ponding of water.

Indicator: Observable damage based on hydrologic assessment following a 2-year, 24-hour event.

Additional Quality criteria are met when planned measures provide for all water system discharges to be safely disposed of through stable outlets of adequate capacity. Water disposal system discharges are not to be changed from natural drainage ways unless required land and water rights have been obtained.

E. Water Management for Irrigated Land

Definition: Inefficient and/or untimely use of existing water supplies (precipitation, surface flows, stored water, and groundwater) restricts the desired use of the land. Includes lands under supplemental irrigation.

***QUALITY CRITERIA*:**

Target: The management of the irrigation system shall be at a level to insure adequate irrigation water management is being applied to conserve water under the control of the irrigator.

Indicator: The irrigation management and irrigation system shall be evaluated using the Farm Irrigation Rating Index (FIRI). The potential maximum efficiency of the irrigation system being evaluated shall be determined and compared to the planned or existing system's efficiency. Quality criteria is met when the planned or existing system efficiency is 80% of the potential maximum efficiency for the irrigation system being evaluated.

Additional Quality criteria are met when planned measures result in achieving an established percent level of irrigation efficiency for plant and animal production. This level is contained in the Caribbean Area Irrigation guide and may entail shifting from one form of water application to another.

F. Water Management for Non-Irrigated Land

Definition: Inefficient management of precipitation and soil moisture restricts the desired use of the land.

***QUALITY CRITERIA*:**

Target: The management of precipitation and soil moisture shall meet the land manager's objectives. For rangeland, a score of Moderate or greater for the Plant Community Composition and Distribution Relative to Infiltration and Runoff attribute in the Rangeland Health Ecological Attributes Worksheet. For pasture, a score of 3 or greater for the Plant Cover indicator in the Pasture Condition Score Sheet.

Indicator: Observation and interviews to determine if precipitation and soil moisture are used to meet objectives. Rangeland is assessed with the Rangeland Health Ecological Attributes Worksheet in the National Range and Pasture Handbook. Pasture is assessed with the Pasture Condition Scoring procedure in the National Range and Pasture Handbook.

Additional Quality criteria are met when management provides optimum use of natural moisture for the intended land use and is in balance with expected seasonally available moisture. Water budgets contained in Section I of the FOTG will be used where available.

G. Restricted Capacity of Small Water Conveyance Onsite

Definition: Material from the management unit causes a conveyance problem to drainage ditches, road ditches, culverts, and canals within the same management unit.

***QUALITY CRITERIA*:**

Target: Designed discharge capacity or runoff capacity of conveyance is adequate.

Indicator: The desired capacity is met and functioning as designed.

Additional Quality criteria are met when measures are planned so that the capacity is restored, conveyances are maintained at design flow capacity, and the treated area does not contribute to the identified problem. Criteria will be consistent with policy and laws, such as those pertaining to wetlands.

H. Restricted Capacity of Small Water Conveyance Offsite

Definition: Material from the management unit causes a conveyance problem to drainage ditches, road ditches, culverts, and canals outside of the management unit.

***QUALITY CRITERIA*:**

Target: Designed discharge capacity or runoff capacity of conveyance is adequate.

Indicator: The desired capacity is met and functioning as designed.

Quality criteria are met when measures are planned so that the conveyance are maintained at design flow capacity, and the treated area does not contribute to the identified problem. Criteria will be consistent with policy and laws, such as those pertaining to wetlands.

I. Restricted Capacity of Small Water Bodies

Definition: The capacity of reservoirs for water storage is reduced.

***QUALITY CRITERIA*:**

Target: The designed storage capacity is adequate.

Indicator: The desired capacity is met and functioning as designed.

Additional Quality criteria are met when measures are planned so that loss of storage and/or conveyance capacity do not exceed designed or expected rates. Storage capacity of small water bodies is restored where economically feasible. Criteria will be consistent with policy and laws, such as those pertaining to wetlands and riparian areas.

2. WATER QUALITY

GROUND WATER CONTAMINANTS

A. Pesticides

Definition: Pesticides degrade beneficial uses of ground water for domestic, industrial, livestock, irrigation, fish and wildlife or other beneficial uses.

***QUALITY CRITERIA*:**

Target: Pesticides are stored, applied, and disposed so ground water standards are not violated.

Indicators:
Field application and management: Deductive reasoning combined with predictive tools (Windows Pesticide Screening Tool and/or Oregon Water Quality Decision Aid,) to select pesticides that minimize adverse environmental effects and to determine need for mitigating practices so no significant contamination occurs below the root zone.

Pesticide storage, handling, and disposal: Deduction and predictive tools (Pesticide Storage, Handling, and Disposal Worksheet) to determine if pesticides are stored, handled, and disposed of to minimize risk of accidental spill or leakage.

Additional Quality criteria are met when measures are planned so that the application of pesticides is according to label instructions, Cooperative Extension Service recommendations, and an appropriate pesticides leaching and runoff assessment which considers the leaching potential of the pesticides for soil and site conditions, application methods, and other variables such as climate. Federal, commonwealth, and local laws will be followed. Pest Management practice or other practices specifying pesticide use and, where appropriate, irrigation Water Management, become essential practices.

Special considerations should be given to:

(1) soil and climatic conditions;
(2) timing of ap0plications; and
(3) pesticide half-life, method of applications, and form.

In addition, rainfall distribution and intensity versus the time of chemical application, the depth to water table, type of aquifer, distance from sources, the soil and surface water factors that impact pesticide availability, infiltration, and leaching should be considered.

Criteria will be component levels* when stated in Federal, State, or local laws, or non-degradation of existing problem levels.

****Component levels means that the Environmental Quality Board has established levels such as tons/acre, tons/year, waste load allocations.***

B. Nutrients and Organics

Definition: Application of commercial fertilizers and organic wastes degrade beneficial uses of ground water for domestic, industrial, livestock, irrigation, fish and wildlife or other uses.

***QUALITY CRITERIA*:**

Target: Commercial fertilizers and animal wastes are stored, applied, and disposed so ground water standards are not violated.

Indicators:
Field application and management: Deductive reasoning combined with predictive tools to determine if nutrients and/or animal wastes are applied at rates, forms, and times following a nutrient budget, along with mitigating systems to minimize risk of excessive

leachate below the root zone. Tools include Nitrogen Index, Phosphorus Index, Leaching Index - Soil Rating for Nitrate and Soluble Nutrients.

Fertilizer storage and handling (Commercial fertilizers): Use deduction and predictive tools (Fertilizer Storage and Handling Worksheet) to determine if commercial fertilizers are stored, handled, and disposed of to minimize risk of accidental spill or leakage.

Biosolids: A state approved biosolids and domestic septage management plan and National Pollution Discharge Elimination System permit for the site is required.

Livestock Waste Storage: Use deduction and predictive tools (Livestock Waste Storage Worksheet) to determine if livestock waste storage facilities are adequate to prevent significant loss from leaching and appropriately sized to safely store waste through environmentally unsafe periods to apply.

Livestock Confinement Area: Use deduction and predictive tools to determine if livestock confinement areas are managed to minimize risk of leaching nitrate and pathogenic contaminants (Livestock Confinement Area Worksheet).

Additional Quality criteria are met when measures are planned so that the application of nutrients and organic are in balance with plant requirements considering all nutrient sources, soil characteristics, optimum yields, and climatic factors. Federal commonwealth and local laws will be followed. Criteria will include use of the Nutrient Management practice as an essential practice and when organic wastes are applied as a nutrient source, Waste Utilization practice becomes an essential practice also.

Nutrient criteria considers:

(1) nutrient rate being applied relative to the given crops and soils;

(2) timing of application versus rainfall distribution and intensity;

(3) nutrient form;

(4) method of application;

(5) depth to water table; and type of aquifer;

(6) soil and vadose zone factors that impact changes in chemical nutrient form, solubility and transport;

(7) plant residual.

If manure is being applied, additional consideration should be given for manure nutrient content, which varies by kind, age and diet of animals; the moisture content; method of handling and field application; and other factors. Periodic testing of manure nutrient content may be part of these criteria. In addition, consideration should be given to excessive rates of manure application, which can result in a buildup of organic N in the soil that can cause a buildup of NO (nitrates) in the ground water. Periodic soil testing and manure nutrient analysis is essential preliminary procedures to monitor the balance of crop requirements, fertilizer input, and rate of manure application.

Criteria will be component levels* when stated in Federal, Sate, or local laws, or non-degradation of existing problem levels.

****Component levels means that the Environmental Quality Board has established levels such as tons/acre, tons/year/ waste load allocations.***

C. Salinity

Definition: Salts such as sodium, calcium, potassium, boron, and selenium present over naturally occurring rates degrade beneficial uses of groundwater.

***QUALITY CRITERIA*:**

Target: Salts reaching the ground water aquifers do not exceed allowable standards

Indicators: Measurements of electrical conductivity can be used as an indicator of excessive salinity or total dissolved salts. For drinking water electrical conductivity should be less than 0.7 dS/M. Taste can be used as an indicator in lieu of testing for total dissolved salts for drinking water. Increased salinity of groundwater used for irrigation should not reduce agronomic crop yields.

Additional Quality criteria are met when measures are planned so that the treated area no longer adversely contributes to ground water contamination from salinity.

Criteria take into consideration the presence of a high water table, and saline vadose zone or aquifer. Criteria also considers such practices as Irrigation Water Management and Soil Salinity Management that reduce seepage and deep percolation, and the buildup of salt in ditches, canals, streams, and ground water. If salinity ground water contaminants result from irrigation, the irrigation Water Management becomes an essential practice. Practices will prescribe crop rotations that include plants and grasses that uptake water sufficiently to lower the water table and to decrease salt buildup, dissolved salt removal, and the interflow and deep seepage directly into the water table.

Criteria will be component levels* when stated in Federal, State, or local laws, or non-degradation of existing problem levels.

**** Component levels means that the Environmental Quality Board has established levels such as tons/acre, tons/year/ waste load allocations.***

D. Heavy Metals

Definition: Metal compounds degrade beneficial uses of groundwater by the application of organic wastes in municipal or industrial sludges (biosolids).

***QUALITY CRITERIA*:**

Target: Heavy metals and organics reaching a ground water aquifer do not exceed allowable standards.

Indicators: A state approved biosolids and domestic septage management plan and National Pollution Discharge Elimination System permit for the site is required.

Additional Quality criteria are met when measures are planned so that the treated are no longer adversely contributes to ground water contamination from heavy metals. Criteria considers the following:

- ***If heavy metal contamination can be reduced to a safe level, or soil PH can be controlled to reduce contamination, lower the use to that safe level or control the soil PH.***

  If the heavy metal contaminants cannot be continually applied at a safe level, substitute another product that does not cause contamination.

The practices Nutrient Management and Waste Utilization should have a positive effect on reducing the problem.

Criteria will be component levels* when stated in Federal, State, or local laws, or non-degradation of existing problem levels.

** Component levels means that the Environmental Quality Board has established levels such as tons/acre, tons/year/ waste load allocations.*

E. Pathogens

Definition: Pathogens such as bacteria, viruses, protozoans, parasites, or fungi associated with animal wastes create human or animal health problems associated with beneficial uses of groundwater.

***QUALITY CRITERIA*:**

Target: Pathogens reaching a ground water aquifer do not exceed allowable standards.

Indicators: Deduction and Nutrient and Organic Criteria Indicators are used to determine if animal wastes are managed so there is no significant delivery of pathogens to groundwater.

Additional Quality criteria are met when measures are planned so that the treated area no longer adversely contributes to ground water contaminants from pathogens. Management will identify the type or organisms, such as fecal streptococcus, being used to reflect change; the field conditions of the soil organic matter and texture; and the moisture content, soil temperature, and other physical and chemical factors that influence transport and decomposition of micro-organisms.

If the source of pathogens is from organic waste, the essential practice to provide for reduction or death of pathogens in handling or storage of waste. If the pathogens are from waste application, the practice Waste Utilization will become essential. Waste Utilization is to provide for application at times when soils and climatic conditions are likely to cause organisms to die and waste will not be applied to areas subject to direct entry to ground water. Planning needs to consider that pathogens can be transported in both soluble and particulate forms.

Criteria will be component levels* when stated in Federal, State, or local laws, or non-degradation of existing problem levels.

**** Component levels means that the Environmental Quality Board has established levels such as tons/acre, tons/year/ waste load allocations.***

SURFACE WATER CONTAMINANTS

G. Pesticides

Definition: Pesticides degrade beneficial uses of surface water for domestic, industrial, livestock, irrigation, fish and wildlife or other beneficial uses.

***QUALITY CRITERIA*:**

Target: Pesticides are stored, applied, and disposed so that surface water standards are not violated.

Indicators:
Field application and management: Deductive reasoning combined with predictive tools, such as Windows Pesticide Screening Tool, to select pesticides that minimize adverse environmental effects and to determine need for mitigating practices so no significant contamination occurs to surface waters.
Pesticide storage, handling, and disposal: Deduction and predictive tools (Pesticide Storage, Handling, and Disposal Worksheet) to determine if pesticides are stored, handled, and disposed of to minimize risk of accidental spill or leakage.

Additional Quality criteria are met when measures are planned so that the application of pesticides is according to label instructions; State Cooperative Extension Service recommendations; and an appropriate pesticide assessment which considers the potential loss of pesticides dissolved in the runoff water an/or attached to soil particles transported by water and wind, and proximity to the water bodies. Federal, state, and local laws will be followed. Criteria will include use of the Pest Management practice or other practices specifying pesticide use and, where appropriate, Irrigation Water Management, and these become essential practices. Criteria considers the following:

- ***If the pesticide contamination can be reduced to a safe level, lower the use to that safe level.***

- ***If the pesticide contaminants cannot be continually applied at a safe level, substitute another product that does not cause contamination.***

- ***If a safe level of the contaminant cannot be achieved or if a suitable substitute is not available, consider other methods of Pest Management.***

H. Nutrient and Organic Wastes

Definition: Application of commercial fertilizers and other organic wastes degrade beneficial uses of surface water for human consumption, livestock watering and impair aquatic life.

***QUALITY CRITERIA*:**

Target: Commercial fertilizers and organic wastes are stored, applied, and disposed of following pertinent regulations.

Indicators:
Field application and management: Deductive reasoning combined with predictive to select nutrients to minimize adverse environmental effects. Determine the need for mitigating practices so no significant runoff or subsurface flows containing nutrients or organic waste occurs beyond field boundaries. Models include the Nitrogen Index, Phosphorus Index, Water Quality Indicators Guide – Field Sheet 3B – Nutrients, Water Quality Indicators Guide – Field Sheet 2B – Animal Waste Pasture or Range, or Water Quality Indicators Guide – Field Sheet 2B – Animal Waste Totally or Partially Confined.
Fertilizer storage and handling (Commercial fertilizers): Deduction and predictive tools (Fertilizer Storage and Handling (Commercial fertilizers)) to determine if commercial fertilizers are stored, handled, and disposed of to minimize risk of accidental spill or leakage.
Livestock Waste Storage: Deduction and indictor tools (Livestock Waste Storage Worksheet) to determine if livestock waste storage facilities are adequate to prevent significant loss from surface loss and appropriately sized to safely store waste through environmentally unsafe periods to apply.
Livestock Confinement Area**:** Deduction and predictive tools (Livestock Confinement Area Worksheet) used to determine if livestock confinement areas are managed to minimize risk of contaminated runoff of nitrate and pathogenic contaminants.
Biosolids: A state approved biosolids and domestic septage management plan and National Pollution Discharge Elimination System permit for the site is required.

Additional Quality criteria are met when measures are planned so that the application of nutrients and organics are in balance with plant requirements considering all nutrient sources, soil characteristics optimum yields, runoff loss potential of nutrients dissolved in the runoff water and/or attached to soil particles transported by water and wind, and proximity to the water body. Federal, State and local laws will be followed. Criteria includes use of the Nutrient Management practice, which becomes an essential practice. When organic wastes are applied as a

nutrient source, Waste Utilization becomes an essential practice. Criteria considers the following:

- ***If the nutrient and organic contamination can be reduced to a safe level, lower the use to that safe level.***

- ***If the nutrient and organic contaminants cannot be continually applied at a safe level, substitute another product that does not cause the contamination.***

- ***If a safe level of the nutrient and organic contaminants cannot be achieved or if a suitable substitute is not available, the material identified as a contaminant will not be used.***

Nutrient criteria needs to consider:

(1) Nutrient rate being applied relative to the given crops and soils;

(2) timing of application versus rainfall distribution and intensity;

(3) nutrient form;

(4) method of application;

(5) soil and vadose zone factors that impact changes in chemical nutrient form, solubility and transport;

(6) plant residual.

If manure is being applied, additional consideration should be given for manure nutrient content, which varies by kind, age, and diet of animals; the moisture content; method of handling; and other factors. Periodic testing of manure nutrient content may be part of these criteria.

In addition, consideration should be given to excessive rates of manure application, which can result in a buildup of nitrogen or phosphorous in the soil, and increased nutrients in surface runoff.

Periodic soil testing and manure nutrient analyses are essential preliminary procedures to monitor the balance of crop requirements, fertilizer input, and rate of manure application.

Criteria should consider practices that reduce enrichment ratios and control runoff using proper disposal systems. Criteria will be component levels* when stated in Federal, State, and local laws, or non-degradation of existing problem.

**** Component levels means that the Environmental Quality Board has established levels such as tons/acre, tons/year/ waste load allocations.***

I. Suspended Sediments and Turbidity

Definition: Beneficial uses of surface water are degraded because of excessive sedimentation and turbidity which can be harmful to fish or other aquatic life or detrimental to public health, recreation and industry.

***QUALITY CRITERIA*:**

Target: Sedimentation and turbidity meet surface water quality standards.

Indicators: Deduction, predictive tools (Sediment and Turbidity Worksheet or Water Quality Indicators Guide – Field Sheet 1B: Sediment), and soil erosion quality criteria.

Additional Quality criteria are met when measures are planned so that the treated area no longer adversely contributes to the identified suspended sediment and turbidity problem that has limited the intended use of the water. The measures generally involve controlling erosion that has higher rates of sediment yields (such as ephemeral or classic gullies) to prevent material entering receiving waters.

Criteria will be component levels* when stated in Federal, State, and local laws, or non-degradation of existing problem.

**** Component levels means that the Environmental Quality Board has established levels such as tons/acre, tons/year/ waste load allocations.***

J. Low Dissolved Oxygen

Definition: Beneficial uses of surface waters to support aquatic organisms including fish, invertebrates, and aquatic plants are negatively impacted by low levels of dissolved oxygen.

***QUALITY CRITERIA*:**

Target: Dissolved oxygen levels meet established standards.

Indicators: Deductive reasoning and/or direct measurement to meet quality criteria for nutrients, sediment, turbidity, temperature and aquatic habitat suitability.

Additional Quality criteria are met when measures are planned so that the treated area does not contribute contaminant at a level that adversely affects the surface water. Federal, state, and local laws will be followed. Management will consider sediment in aquatic habitat, especially in spawning areas. Some practices will result in a decrease in total organic carbon in offsite sediment and a corresponding improvement in the level of dissolved oxygen. Consideration should be given to decreasing sediment yields and offsite sedimentation. If organic wastes are a contributor to low dissolve oxygen, then Waste Utilization will become an essential practice. If nutrients are a contributor to low dissolve oxygen, then Nutrient

Management will become an essential practice. Measures will result in improving dissolve oxygen to an acceptable level for the intended use if possible.

K. Salinity

Definition: Salts such as sodium, calcium, potassium, boron, and selenium present over naturally occurring rates degrade beneficial uses of surfacewater.

***QUALITY CRITERIA*:**

Target: Salts reaching the surface water aquifers do not exceed allowable standards

Indicators: Measurements of electrical conductivity can be used as an indicator of excessive salinity or total dissolved salts. For drinking water electrical conductivity should be less than 0.7 dS/M. Taste can be used as an indicator in lieu of testing for total dissolved salts for drinking water. For most crops and freshwater aquatic plants electrical conductivity should be less than 3.0 dS/M to meet quality criteria. Salt tolerances for specific crops can be found in the Oregon Engineering Handbook Irrigation Guide, Part OR682.40.

Additional Quality criteria are met when measures are planned so that the treated area does not contribute contaminant at a level that adversely affects the surface water. Federal, state, and local laws will be followed. If salinity surface water contamination results from irrigation, then Irrigation Water Management will become an essential practice. If the source of salts is from fertilizer or other applied chemicals, then Nutrient Management practice will become and essential practice and if organic waste applications are contributing to the salinity problem, Waste Utilization becomes an essential practice. Criteria considers the following:

- ***If the salinity contamination can be reduced to a safe level, lower the use of the contaminants to that safe level.***

- ***If the contaminants cannot be continually applied at a safe level, substitute another product that does not cause the contamination.***

L. Heavy Metals

Definition: Metal compounds degrade beneficial uses of surface water by the application of organic wastes in municipal or industrial sludges (biosolids).

***QUALITY CRITERIA*:**

Target: Heavy metals and organics reaching surface water do not exceed allowable standards.

Indicators: A state approved biosolids and domestic septage management plan and National Pollution Discharge Elimination System permit for the site is required.

Additional Quality criteria are met when measures are planned so that the treated area does not contribute contaminant at a level that adversely affects the surface water. Federal, state, and local laws will be followed. Criteria considers the following:

If the heavy metal contamination can be reduced to a safe level, lower the use to that safe level.

If the heavy metal contaminants cannot be continually applied at a safe level, substitute another product that does not cause the contamination.

The Nutrient management and Waste Utilization practices are essential practices.

M. Temperature

Definition: Water temperature, impacted by human inputs, does not support intended beneficial use.

***QUALITY CRITERIA*:**

Target: The land user's management activities do not contribute to the temperature problem.

Indicators: Direct measurement during critical temperature time periods can be used for waters (i.e. farm pond) contained within a conservation management unit. Deduction and predictive tools should be used for flowing waters and larger lakes. Indicators for stream temperatures include suitable aquatic habitat, shade/canopy, and geomorphic condition. Use appropriate components of predictive tools listed under aquatic habitat suitability.

Additional Quality criteria are met when measures are planned so that the treated area does not contribute contaminant at a level that adversely the surface water. Federal, state, and local laws will be followed. Practices that promote increase in vegetative canopy or low flow augmentation, when possible, along streams should be considered essential.

N. Pathogens

Definition: Pathogens such as bacteria, viruses, protozoans, parasites, or fungi associated with animal wastes create human or animal health problems associated with beneficial uses of surface water.

***QUALITY CRITERIA*:**

Target: Pathogens reaching a surface water aquifer do not exceed allowable standards.

Indicators: Deduction and Nutrient and Organic Criteria Indicators are used to determine if animal wastes are managed so there is no significant delivery of pathogens to surface water.

Additional Quality criteria are met when measures are planned so that the treated area does not contribute contaminant at a level that adversely the surface water. Federal, state, and local laws will be followed. Management will identify the type of organisms, such as fecal streptococcus, being used to reflect change, the field conditions of the soil organic matter and texture; and the moisture content, soil temperature, and other physical and chemical factors that influence transport and decomposition of micro-organisms. If the source of pathogens is from organic waste, the practice Waste Management System becomes an essential practice to provide for reduction or death of pathogens in handling or storage of waste. If the pathogens are from waste application, the practice Waste Utilization will become essential. Waste Utilization will provide for application at times when soil and climatic conditions will cause organisms to die, and waste should not be applied to areas subject to direct entry to surface water. Because pathogens can be transported in both soluble and particulate forms, proper waste disposal system(s) for practices used to reduce runoff shall be considered. Criteria will be component levels* when stated in Federal, State or local laws, or non-degradation of existing problem levels.

****Component levels means that the Environmental Quality Board has established levels such as tons/acre, tons/year, waste load allocations.***

O. Aquatic Habitat Suitability

Definition: The quality of surface waters to support aquatic life is limited by inadequate habitat. Aquatic habitat including riparian and instream habitats, migration routes, thermal conditions, flow regime, stream morphology or floodplain function is impaired by management activities. Habitat for invertebrates, amphibians, fish or other aquatic and terrestrial species is limited.

***QUALITY CRITERIA*:**

Target: A Stream Visual Assessment Protocol rating of Good with static trend or Fair with upward trend, or a Biology Tech Note 12 rating of greater than .7 or a rating of .5 to .7 with upward trend. Rationale for upward trend will be documented and attached to the Stream Visual Assessment Protocol and Biology Tech Note 12.

Indicators: Stream Visual Assessment Protocol or Biology Tech Note 12.

Additional Quality criteria are met when measures are planned so that water bodies provide suitable habitat for species of concern to grow, reproduce, and perpetuate acceptable population levels. Consideration is given to erosion control practices that substantially reduce sediment yield and nutrient enrichment and to the associated sediment deposition reduction practices. Consideration should also be given to

determine if any endangered and threatened aquatic species exist in receiving waters. Criteria will be met when those measures are planned that provide for a positive trend towards improving aquatic habitat suitability for the species of concern. Criteria will be component levels* when stated in Federal, State or local laws, or non-degradation of existing problem levels.

****Component levels means that the Environmental Quality Board has established levels such as tons/acre, tons/year, waste load allocations.***

Resource - Air

1. AIR QUALITY

A. Airborne Sediment Causing Safety Problems

Definition: Airborne sediment causes safety problems resulting in potential negative impacts for humans and animals.

***QUALITY CRITERIA*:**

Target: Airborne sediment levels shall not degrade air quality within or outside the planning area to unsafe levels.

Indicator: Visual observation, interview with client, local officials, and other local and regional information included in the Field Office Technical Guide.

B. Smoke Particulates Causing Safety Problems

Definition: Smoke particulates cause safety problems resulting in negative impacts for humans and animals.

***QUALITY CRITERIA*:**

Target: Smoke particulates shall not degrade air quality within or outside the planning area to unsafe levels.

Indicator: A local or state approved smoke management plan or permit where required, visual observation, interviews with client's and local officials or other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria for A and B are met when measures are planned so that treated areas do not adversely affect visibility; human, animal, or plant health, the design life of equipment, buildings, and appurtenances; or the functioning of conveyance structures. Applicable Federal, commonwealth, or local laws and regulations will be followed. Prescribed Burning is an essential practice when burning is involved and not in violation with state laws and regulations..

C. Airborne Sediment Causing Machinery and/or Vehicle and Structural Problems

Definition: Airborne sediment results in negative impacts to machinery, vehicle operations or structures.

***QUALITY CRITERIA*:**

Target: Airborne sediment levels originating in the planning area shall not cause unacceptable damage to equipment or structures on or off site.

Indicator: Visual observation, interview with client or local officials and other sources of local and regional information included in the Field Office Technical Guide.

D. Smoke Particulates Causing Machinery and/or Vehicle and Structural Problems

Definition: Smoke particulates result in negative impacts to machinery, vehicles or structures.

***QUALITY CRITERIA*:**

Target: Levels of smoke particulates originating in the planning area shall not result in negative impacts on or offsite.

Indicator: A local or state approved smoke management plan or permit where required, visual observation, interviews with client's and local officials or other sources of local and regional information included in the Field Office Technical Guide.

E. Airborne Sediment Causing Health Problems

Definition: Airborne sediment results in negative impacts to the health of humans and animals.

***QUALITY CRITERIA*:**

Target: Airborne sediment originating in the planning area shall not reach levels that negatively impact the health of humans and/or animals.

Indicator: Visual observation, interviews with client and local officials and other sources of local and regional information included in the Field Office Technical Guide.

F. Smoke Particulates Causing Health Problems

Definition: Smoke particulates result in negative health impacts to humans and animals.

***QUALITY CRITERIA*:**

Target: Levels of smoke particulates originating in the planning area shall not result in negative health impacts on or offsite.

Indicator: State and local regulations on smoke producing activities, visual observations, interviews with client's and local officials and other sources of local and regional information included in the Field Office Technical Guide.

G. Airborne Sediment Causing Conveyance Problems

Definition: The capacity of drainage ditches, road ditches, culverts, and canals are restricted by deposits of airborne sediment.

***QUALITY CRITRIA**:*

Target: Airborne sediment originating in the planning area shall not reduce the capacity of on site or off site conveyance structures.

Indicator: Visual observations, interviews with client and local officials and other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when measures are planned so that treated areas do not adversely affect visibility; human, animal, or plant health the design life of equipment, buildings, and appurtenances; or the functioning of conveyance structures. Applicable Federal, commonwealth, or local laws and regulations will be followed. Prescribed Burning is an essential practice when burning is involved.

H. Airborn Chemical Drift

Definition: Airborne drift of agricultural chemicals (pesticides or nutrients) applied above the ground surface leaves the target area and damages other resources.

***QUALITY CRITERIA*:**

Target: No airborne drift of agricultural chemicals will occur outside the target area.

Indicator: Visual observations, interviews with client and local officials and other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when measures are planned so that chemicals are applied according to label instructions and in compliance with applicable Federal, commonwealth, or local laws and regulations without adversely affecting humans and/or non-target plants, animals, or sensitive water bodies. Criteria will include the use of the Pest Management, Nutrient Management, or other practices specifying that chemicals are to be applied. These become essential practices.

I. Undesirable Odors from Agricultural Sources

Definition: Undesirable odors are detected from agricultural operations.

***QUALITY CRITERIA*:**

Target: Objectionable odors originating in the planning area shall be minimized or reduced to acceptable levels for agricultural operations.

Indicator: Odors originating in the planning area do not result in continuing complaints from neighboring landowners.

Additional Quality criteria are met when measures are planned so that airborne odors are minimized and in compliance with applicable Federal, commonwealth, or local laws and regulations. Ways to address problems include such considerations include such considerations as windbreaks, barriers, site locations, prevailing wind direction, time of application (season, humidity, wind direction), location of populated areas, and timeliness of incorporation which can reduce undesirable odors. Such practices as Waste Utilization, Waste Management Systems, Pest Management, and/or Nutrient Management become essential practices.

2. CONDITION

A. Air Temperature

Definition: Air temperature negatively impacts the health, growth and production of plants or animals.

***QUALITY CRITERIA*:**

Target: Activities within the planning area that negatively impact air temperature for the health, growth and production of plants and animals are acceptable.

Indicator: Observation, local interview or onsite measurement.

B. Movement

Definition: Air movement negatively impacts the health, growth and production of plants or animals.

***QUALITY CRITERIA*:**

Target: Activities within the planning area that negatively impact air movement for the health, growth and production of plants and animals are acceptable.

Indicator: Observation, local interview or onsite measurement.

C. Humidity

Definition: Air humidity negatively impacts the health, growth and production of plants or animals.

***QUALITY CRITERIA*:**

Target: Activities within the planning area that negatively impact air humidity for the health, growth and production of plants and animals are acceptable.

Indicator: Observation, local interview or onsite measurement.

Additional Quality criteria are met when measures are planned that alleviate or modify adverse human-induced impacts on plants and animals. Irrigation Systems, Field Windbreaks and Farmstead Windbreaks are desirable practices.

Resource - Plants

1. SUITABILITY

A. To Site

Definition: Plants are not adapted to soil and climatic conditions on the site.

***QUALITY CRITERIA*:**

Target: Desired species are adapted to the site. Plant species of concern are not negatively impacted.

Indicator: Visual observation, interview with client, soil survey information, ecological site description, Caribbean Area Guide for Conservation Seedings and Plantings, and other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when planned measures either modify the site to better suit the plants or change plants that will contribute toward achieving the quality level as in the FOTG for the land use. Prescribed Grazing, Conservation Crop Rotation or Forest Stand Improvement are essential practices. Consideration will be made in planned measures so that threatened or endangered species are not negatively impacted.

B. To Intended Use

Definition: Plants do not meet the ecological and/or client's management objectives on the site.

***QUALITY CRITERIA*:**

Target: Species are appropriate for the intended use, within site condition restraints. For rangeland, a score of Moderate or greater for the Functional/Structural Groups attribute in the Rangeland Health Ecological Attributes Worksheet. For pasture, a score of 3 or greater for the Percent Desirable Plants indicator in the Pasture Condition Score Sheet.

Indicator: Visual observation, interview with client, soil survey information, ecological site description, Oregon seeding guide, and other sources of local and regional information included in the Field Office Technical Guide. Rangeland is assessed with the Rangeland Health Ecological Attributes Worksheet in the National Range and Pasture Handbook. Pasture is assessed with the Pasture Condition Scoring procedure in the National Range and Pasture Handbook.

Additional Quality criteria are met when planned measures shift to plants that will be suitable for the planned use and contribute toward achieving the quality level as stated for the land use. All conservation measures will be planned so that threatened or endangered species are not negatively impacted. Prescribed Grazing, Conservation Crop Rotation or Forest Stand Improvement are essential practices.

Additional Quality criteria are met when plants on all land uses are used, maintained and improved to achieve acceptable production levels to meet conservation, environmental, decision-maker, and public objectives

Nutrient applications for any land use are based on plant nutrient requirements, production requirements, soil test recommendations, soil fertility, soil potential limitations, water budget, and the types of practices planned. Nutrients from all sources (animal, waste, crop residue, soil residual, commercial fertilizer, atmospheric-fixed) are considered when calculating the amount of nutrients to apply. Timing, method, and rate of application and chemical forms of nutrients to be applied are taken into consideration in planning practices.

Pesticide applications for any land use are applied according to the label recommendation and federal, state, and local regulations.

On croplands, crops are grown in a planned sequence that meets conservation, production, and decision-maker objectives; and weeds, insects, other pests, and diseases are adequately treated.

On Hayland, dominant native or introduced plant species are appropriate for the forage, agronomic, or commercial use; well adapted to the ecosystem; and their stand density is maintained or improved.

On Native Pasture herbaceous plants are properly grazed, forage value rating is medium or better, vigor is strong and is commensurate with overstory canopy.

On Pastureland, dominant plant species are appropriate for the use, adapted to the ecosystem, and their stand density is adequate and productivity is maintained or improved.

On Rangeland, the plant community is managed to meet the needs of the plants and animals in a manner to conserve the natural resources and meet the objectives of the decision-maker. As a general rule, rangeland in poor or fair ecological range condition will be managed for a static or upward range trend. In some special situations, poor or fair ecological range condition could be managed for a static range to meet special objectives of the decision-maker as long as there is no degradation of the soil , water, air, and animal resources.

On forestland, trees are well distributed, vigorous, relatively free of insects, disease, and other damage, and the density of the stand is within 25% of forest stand density guide spacing on a stems-per-acre basis for the particular forest types. Forestland shall be protected from wildfires and erosion. Forest Land that is grazed shall also be managed to meet the needs of the forage plants, the animals, and the objective of the

decision-maker. On land where trees are for the purpose of watershed protection and/or aesthetics, the minimum quality criteria will be protection from wildfires and erosion.

On Wildlife Land, Recreation Land, and other Land, adapted or native plants are of sufficient quantity and quality to improve or protect the defined resource and keep ecological balance.

On Urban Land uses, soil cover is maintained using suitable plants or other cover to keep soil erosion within accep0table limits, minimize runoff, and manage infiltration.

2. CONDITION

A. Productivity

Rangeland

Definition: Plants do not produce forage, cover, or wildlife habitat in the quantity, quality, or timeliness needed.

***QUALITY CRITERIA*:**

Target: Either of the following:

a. Rangelands are at or above 60 percent rangeland similarity index with a stable or upward trend for historic climax or naturalized plant community described in the appropriate ecological site descriptions, and score of Moderate or greater for the Annual Production attribute in the Rangeland Health Ecological Attributes Worksheet.

b. Rangelands have a stable or upward trend and adequate plant residues for soil protection during the critical erosion period when the site: 1) is apparently below an ecological threshold which will prevent recovery to former historic climax, or 2) will make an unusually slow recovery in spite of planned treatments.

Indicator: Visual observation, interview with client, soil survey information, ecological site descriptions and other sources of local and regional information included in the Field Office Technical Guide. Trend, rangeland similarity index, and rangeland health procedures in National Range and Pasture Handbook.

Additional Quality criteria are met when planned measures provide the following:

Seeded Ecological Rangeland Productivity of seeded species is 75 percent or more of the soil potential based on the FOTG, Section II, and key management species constitute at least 75 percent of the total production.

Annual Rangeland: Adequate plant residues are left on the soil surface at the end of the grazing season to protect the soil resource and productivity is 75 percent or more of the soil potential based on the FOTG, Section II.

Wildlife land, recreation land, and other land: Adapted or native plants are in sufficient quantity and quality to improve or protect the defined resource.

All conservation measures will be planned so that threatened and endangered species are not negatively impacted.

Non-Commercial Forest Land

Definition: Plants do not produce forage, cover, or wildlife habitat in the quantity, quality or timeliness needed.

QUALITY CRITERIA

Target: Principal native tree species form a stand canopy of 10 percent or greater and forest environment provides for perpetuation and reproduction of principal plant species natural to the site. Understory plant community is comprised of 50 percent or more, by weight, of expected species for the site, and kinds and amounts of understory species are commensurate with overstory canopy.

Indicator: Visual observation, interview with client, soil survey information, ecological site description and other sources of local and regional information included in the Field Office Technical Guide.

Commercial Forest Land

Definition: Plants do not produce wood fiber, forage, cover, or wildlife habitat in the quantity, quality or timeliness needed.

QUALITY CRITERIA

Target: Stocking levels are within 25 percent of the D+ spacing guide or equivalent (on a stems/acre basis) for the managed species. Trees within the stand are well distributed (no tree further than 2 times the D+ spacing guide, in feet, from another tree). Understory plant community is comprised of 50 percent or more, by weight, of expected species for the site, and kinds and amounts of understory species are commensurate with overstory canopy.

Indicator: Visual observation, interview with client, soil survey information, ecological site description, and other sources of local and regional information included in the Field Office Technical Guide. Determine stocking levels by zig-zag transects, fixed plots or basal area sampling methods.

Additional Quality criteria are met when planned measures for forest stand is at least 75 percent of the appropriate standard stocking guide recommended for the forest type and/or woodland suitability group based on the FOTG, Section II.

Cropland

Definition: Managed plants do not produce the yields, plant cover or wildlife habitat in the desired quantity, quality or timeliness needed.

***QUALITY CRITERIA*:**

Target: Plant production (yields, plant cover and habitat) shall average 80 percent or more of the potential for the planning soil or 80 percent of the target required for meeting the client's objective.

Indicator: Visual observation, interview with client, soil survey information for site and other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when planned measures of crop yield is 75 percent or more of the high management yield potential for the soil map unit based on the FOTG, Section II.

Pasture and Hayland

Definition: Plants do not produce forage, roughage, cover, or wildlife habitat in the quantity, quality, or timeliness needed.

***QUALITY CRITERIA*:**

Target: Plant production (yields, plant cover and habitat) shall average 80 percent or more of the potential for the planning soil or 80 percent of the target required for meeting the client's objective.

Indicator: Visual observation, interview with client, soil survey information, forage suitability groups, and other sources of local and regional information included in the Field Office Technical Guide. Pasture is assessed with the Pasture Condition Scoring procedures in National Range and Pasture Handbook.

Additional Quality criteria are met when measures planned are so that productivity of desirable or key species is increasing and condition is in an upward trend for ecological range sites in poor or fair range condition toward a goal of good range condition. Range site trends are upward or at least static within the conservation treatment unit.

B. Health & Vigor

Definition: Plants do not manufacture sufficient plant food to continue the growth cycle or to reproduce.

QUALITY CRITERA:

Target: Managed plants exhibit growth potentials for the site, no evidence of stress due to management, and are not overly susceptible to drought, disease or pest damage or competition. For rangeland, a score of Moderate or greater for the Plant Mortality/Decadence attribute in the Rangeland Health Ecological Attributes Worksheet. For pasture, a score of 4 or greater for the Plant Vigor indicator in the Pasture Condition Score Sheet.

Indicator: Visual observation, interview with client, soil survey information, ecological site description, and other sources of local and regional information included in the Field Office Technical Guide. Rangeland is assessed with the Rangeland Health Ecological Attributes Worksheet in the National Range and Pasture Handbook. Pasture is assessed with the Pasture Condition Scoring procedure in the National Range and Pasture Handbook.

Additional Quality Criteria are met when measures planned are so that plants do not show evidence of stress due to lack of management, and growth is not impaired due to weeds, diseases, or insects. All conservation measures will be planned so that threatened and endangered species are not negatively impacted.

C. Plant Damage from Blowing Soil

Definition: Damage from blowing soil causing plant abrasion, exposure of plant root systems and plant blowouts, resulting in significant losses in yield, cover or habitat.

***QUALITY CRITERIA*:**

Target: Cropland: The estimated soil erosion rate from wind erosion will not exceed the estimated Crop Tolerances to Soil Loss (Blowing) for the crop being managed during the critical growth period. Other Land Uses: Plant damage from wind erosion does not result in significant yield or stand reduction.

Indicator: Cropland: The estimated wind erosion, using WEQ Management Period for the plant critical period will not exceed the Estimated Crop Tolerances to Soil Loss as indicated in Section I, Erosion Prediction and the National Agronomy Manual. Other Land Uses: Where plant tolerances are unavailable visual observation and interview with the client will be used. Also soil survey information, and other sources of local and regional information included in the Field Office Technical Guide.

3. MANAGEMENT

A. Establishment, Growth, and Harvest

Definition: The current management does not adequately meet plant establishment, growth, and harvest objectives.

***QUALITY CRITERIA*:**

Target: Establishment: Desired species constitute; 95 percent or more of desired plant density on cropland, 85 percent or more on pasture and hayland, 60 percent or more on rangelands, and 85 percent or more of planned stocking rate on forest lands.

Growth: Management levels provide for plant growth that meet objectives for the site. Plants manufacture sufficient food to complete their growth

Harvest: Harvesting occurs at a frequency, intensity, duration, and timing that meet the objectives and provide for long-term sustainability of resources.

Indicator: Visual observation, interview with client, soil survey information, ecological site description, and other sources of local and regional information and other inventory assessment tools included in the Field Office Technical Guide.

Additional Quality criteria are met when conservation measures provide the following:

Plants manufacture sufficient plant food to complete their growth cycle, including natural regeneration where applicable and are harvested in a timely manner to sustain productivity. Threatened and endangered species will be considered in the development of management measures.

B. Nutrient Management

Definition: The correct amount of plant nutrients are not available to meet plant needs.

***QUALITY CRITERIA*:**

Target: Plant nutrient needs are based on realistic client yield goals, site potentials and a nutrient budget (when plant nutrients and soil amendments are applied).

Indicator: Visual observation, interview with client, soil survey information, soil tests, nutrient management guides and other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when planned measures provide for plant nutrients to be applied to meet the needs of the plant without having adverse effects on other resources. When nutrients are to be applied, the Nutrient Management practice becomes essential. Where the source of nutrients is from organic wastes, then Waste Utilization becomes an essential practice.

C. Pests

Definition: Pests (undesirable plants, insects, animals, diseases, and fungi) have an adverse effect on the plant species of concern and the manager's objectives.

***QUALITY CRITERIA*:**

Target: Planned treatment effectively reduces adverse impacts of pests to a level that production, condition, and plant quality goals are reached or maintained.

Indicator: Visual observation, interview with client, soil survey information, and other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when planned measures stipulate that pests are managed based on threshold levels where available to achieve the desired production without having adverse effects on other resources. Federal, State, and local pest laws or regulations will be followed. Threatened and endangered species will be considered in the planned measures so that negative impacts are avoided. When pest control is planned, Pesticide Management will be an essential practice

Threatened and endangered species

Additional Quality criteria are met when threatened and endangered species are identified per Section I, FOTG, actions and procedures will conform with laws and established policy.

Resource – Animals

1. HABITAT

Domesticated Animals

A. Food

Definition: Quantity and quality of food are inadequate to meet the seasonal requirements of domesticated animals.

***QUALITY CRITERIA*:**

Target: Nutritional requirements of animals are met so that health, growth, reproduction, lactation and general well being is maintained. Domesticated animals are in adequate condition.

Indicator: Visual observation, Body Condition Score, interview with client or other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when planned measures provides for the quantity and quality of food that is adequate to meet the nutritional requirements of the livestock. Prescribed Grazing will be considered an essential practice.

B. Cover and/or Shelter

Definition: Cover and/or shelter are inadequate for animals.

***QUALITY CRITERIA*:**

Target: Health and general well being of domestic animals is adequate.

Indicator: Visual observation, body condition score, interview with client, and other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when the domestic animals are provided adequate cover and shelter as appropriate for the climatic conditions.

C. Water – Quantity and Quality

Definition: The quantity and quality of drinking water is inadequate for domesticated animals.

***QUALITY CRITERIA*:**

Target: Adequate quantity and quality of water is available to meet the needs of domesticated animals.

Indicator: Visual observation, interview with client, and other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when planned measures provide for a water supply that is adequate, of sufficient quality and is properly distributed to meet the livestocks daily needs. Where water is the limiting factor for the intended use, existing supplies will be maintained or improved or proper distribution of new sources will be developed.

Wildlife

A. Food

Definition: Quantity and quality of food is inadequate for the needs of wildlife.

***QUALITY CRITERIA*:**

Target: Quantity and quality of food is adequate to meet the seasonal requirements of wildlife. Habitat Suitability Guide minimum rating for: Cropland–25%; pasture/hayland–40%; rangeland/woodland-50%; and wildlife areas-75%.

Indicator: Habitat Suitability Guide (Biology Technical Note 27).

For Wildlife, additional quality criteria are met when planned measures provide a minimum of 30 percent quantity and quality of food to meet the seasonal requirements of food and its interspersion with water and cover for the species of concern, including threatened and endangered species.

B. Cover and/or Shelter

Definition: Cover, shelter and/or space are inadequate for the needs of wildlife.

***QUALITY CRITERIA*:**

Target: Quantity and quality of cover, shelter and space are adequate to meet the seasonal requirements of wildlife. Habitat Suitability Guide minimum rating for: Cropland–25%; pasture/hayland–40%; rangeland/woodland-50%; and wildlife areas-75%.

Indicator: Habitat Suitability Guide (Biology Technical Note 27).

For Wildlife, additional quality criteria are met when planned measures provide a minimum of 30 percent cover and its interspersion with food and water for the species of concern, including threatened and endangered species, and provide for adequate cover availability for the intended use.

C. Water – Quantity and Quality

Definition: Water quantity and/or quality are inadequate for the needs of wildlife.

***QUALITY CRITERIA*:**

Target: Quantity and quality of food, cover, water and space are adequate to meet the seasonal requirements of wildlife. Habitat Suitability Guide minimum rating for: Cropland–25%; pasture/hayland–40%; rangeland/woodland-50%; and wildlife areas-75%.

Indicator: Habitat Suitability Guide (Biology Technical Note 27).

Additional quality criteria are met when planned measures provide a minimum of 30 percent of the habitat potential for the species of concern is achieved regardless of land use, based on an approved habitat evaluation procedure.

2. MANAGEMENT

Domesticated Animals

A. Population / Resource Balance

Definition: Domestic animal population is in a negative balance with feed, forage, and/or wildlife habitat requirements.

***QUALITY CRITERIA*:**

Target: Numbers of domestic animals do not exceed capability of resource (feed, forage, shelter, water, and competition from resident or transient wildlife) and season of use is appropriate for the resource area.

Indicator: Estimated supply and demand of feed and/or forage using procedures in Chapters 5 and 6 of the National Range and Pasture Handbook, Grazing Lands Applications software or other appropriate tools.

Additional Quality criteria are met when planned measures balance the feed, forage, water, cover, space, and other habitat requirements with the planned population numbers of wildlife and domestic animals for their intended use. The measures will be based upon animal forage and feed balance sheets; wildlife habitat inventories; grazing management plans; and habitat management plans. All conservation measures will be planned so that threatened or endangered species are not negatively impacted. Planned Grazing Systems shall be an essential practice.

The minimum resource level of wildlife habitat relative to its potential that is acceptable for the intended use based upon both land user and public objectives areas follows: cropland, 30%; pasture and hayland, 40%; rangeland, 50%; woodland, 50% and wildlife lands, 75%. This criteria is established relative to the habitat inventory methods used to arrive at appropriate levels of habitat potential for the species of concern for each of these land uses.

B. Animal Health

Definition: Proper attention is not given to managing the health of domesticated animals.

***QUALITY CRITERIA*:**

Target: Domesticated animals are in good overall health. Diseases, parasites, and pests are actively controlled.

Indicator: Visual observation, interview with client, and other sources of local and regional information included in the Field Office Technical Guide.

Additional Quality criteria are met when measures and management are planned that reduce to an acceptable level the effects of poisonous plants, disease, parasites, and insects on the species of concern that are caused by improper soil, water, air, and plant resource use.

Wildlife

A. Population / Resource Balance

Definition: Numbers and kinds of wildlife are not in balance with the habitat.

***QUALITY CRITERIA*:**

Target: Numbers of wildlife do not exceed the capability of the resource (food, cover, water and space). The wildlife season of use is appropriate for resource area.

Indicator: No readily discernible imbalance apparent, as indicated by overuse of the habitat or by adversely impacted wildlife species.

B. Wildlife Health

Definition: Proper attention is not given to the health of wildlife.

***QUALITY CRITERIA*:**

Target: Wildlife is in good health, adequate habitat for viable populations is maintained, life-cycle and reproduction requirements are met.

Indicator: Visual observation, interview with client and other sources of local information.